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TITLE	GRADE POINT CORRELATION
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GRADE POINT CORRELATION

DECUS Program Library Write-up

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Abstract

This package of programs calculates correlation matrices for p samplings of a real variable (e.g. student grade point ratios) with n Boolean variables (e.g. subjects taken). The programs can also correlate combinations of the n variables taken m at a time with the real variable. Included in the package are a versatile data tape editor which can be used to prepare an input data tape for the correlator and a program which converts the output of the correlator into percentage correlation matrices.

Minimum Hardware

All programs will run on a 4K-PDP-8 with teletype.

Other Programs Required

The program which calculates percentage correlation matrices requires the FORTRAN compiler and operating system.

General

This package includes three programs: a date tape editor for preparing data tapes for the correlator, a grade point correlator which calculates raw correlation matrices, and a FORTRAN program which converts the raw matrices into percentage matrices. We describe the main correlator first.

The Main Correlator

Let us consider the hypothetical case of a school which wishes to determine how the grade point averages of its students relate to the subjects taken. To solve this problem with the grade point correlator, the user prepares an input tape which contains for each student the subjects he took and his end of semester grade point average. For example, suppose the subjects considered are A, B, and C, and the school's grading system is such that the grade point average is between 0 and 4.00. The correlator can be instructed to count the number of students who took subject A with a grade point average between 0 and .25, the number who subject A with a grade point average between .26 and .50, etc. It will then repeat the process for subjects B and C.

The correlator can also correlate combinations of subjects with the grade point averages. That is, it can be instructed to count the number of students who took both subjects A and B and who made a grade point average between 0 and .25, etc. It will then repeat the correlation for subjects A and C; and B and C. Up to 9 subjects may be correlated in all combinations with the grade point average.

Operating Instructions

The main correlator consists of two tapes both of which must be loaded into the machine with the binary loader. These tapes are labeled "Grade Point Correlator" and "Subroutines for Grade Point Correlator." The second tape contains I/O subroutines for the correlator and other utility programs.

The program starts in 0400g. Upon starting the program, the operator types in two positive integers separated by exactly one space. If these integers are m and n, respectively, the program will correlate n subjects taken m at a time.

The data tape is then run through by placing it in the appropriate reader*. After the data tape has been completely read in, the operator types a 2 on the keyboard and the computer will print out the results of the correlation.

*As initially supplied the program runs on the LSR and LSP. However, it is easily modified to run on other input-output equipment.

Data Tape Preparation.

In order to prepare the data tape, a number is assigned to each subject. For instance, if the school is concerned with subjects A, B, and C, it could assign the number 1 to subject A, 2 to subject B, and 3 to subject C.

The data for each student is put on the tape as follows. The first number on the tape is 1 if the student took the subject A and 0 if he did not take subject A. The second number on the tape is 1 if the student took subject B and 0 if he did not. This pattern continues until n values have been entered on the tape. Following these n values, the grade point average appears. This number must have a decimal point in it and must not contain more than two digits after the decimal point.

Each number must be separated by exactly one non-numeric character other than blank tape or a rubout. Blank tape and rubouts are ignored, and any amount of either may appear anywhere on the tape.

Output of Correlator.

The output of the correlator consists of a series of matrices of the form

n_1	n_2	$n_3 \dots$	n_m
a_{11}	a_{12}	a_{13}	a_{14}
a_{21}	a_{22}	a_{23}	a_{24}
a_{31}	a_{32}	a_{33}	a_{34}
a_{41}	a_{42}	a_{43}	a_{44}

Where $n_1, n_2, n_3, \dots, n_m$ identifies the matrix (a_{ij}) as relating to those students who took subjects n_1, n_2, \dots, n_m . The element a_{ij} is the number of students who took subjects n_1, \dots, n_m and who made a grade point average between

$$(i-1) * .25 (j-1) + .01$$

and

$$(i-1) + .25j$$

except for all where the lower limit is 0 instead of .01.

Percentage calculator.

If it is desired to calculate percentage correlation matrices, generate leader with the teletype of-line. Turn punch off, switch teletype to line, start computer, and type m and n on the keyboard. Then place data tape in reader, turn reader on, and wait until the computer has finished reading in data tape. Then type 2 on the keyboard, turn punch on, and type a space. After the computer has finished its output, generate trailer. Repeat this procedure for as many sets of data as required.

Now compile the FORTRAN program (unless this has already been done.) Load the FORTRAN operating system and compiled program. For each set of results from the correlator, start the FORTRAN program, type in the value of m, place output tape from the correlator in reader, and turn reader on. The output of the percentage calculator is the sum of all the matrix elements for a particular matrix and another matrix of percentages..The percentage matrix has the same format as the original matrix from the correlator.

Note that the percentage calculator must be stopped and restarted for every set of results from the correlator.

Data Tape Editor

The data tape editor can be used to select numbers from a master data tape and prepare a punched tape which can then be used as input to the correlator routine. For example, the master data tape may contain sets of 19 numbers. Each set of numbers constitutes the data for a particular student. These numbers may be spaced in any format on the tape but must be terminated by an ASCII code for a non-numeric item (except ".").

Suppose it is desired to select the 1st, 2nd, and 9th numbers out of each set of 19 numbers. Then the data tape editor is loaded by the binary loader. The user must then set the contents of locations 401₈ through 424₈ as follows.

401	1	412	0
402	0	413	0
403	0	414	0
404	0	415	0
405	1	416	0
406	0	417	0
407	0	420	0
410	0	421	0
411	1	422	0
		423	0
		424	-1

Note that the 1st, 5th, and 9th locations after 400₈ have 1 in them while the others have a 0 except for 424 which has -1 to signify the end of a set of data.

The user then starts the editor in 0200₈, places the master tape in the reader, and turns the reader on. (Note: Leader and trailer must be generated with the teletype off-line.

Miscellaneous

All of these programs are originally written to work with the ASR-33 teletype, but they may be modified to work with any input device.

The main routine echos the input to it; this may be suppressed by making the following changes.

Change Location	From	To
0447	4401	7000
0267	4340	7000

The main correlator and its subroutines occupy locations 0000 through 0663. The amount of memory required by a particular run can be calculated from the formula

$$664_8 + m + n \frac{n!}{m! (n-m)!}$$

If this is larger than 7600, the computer will print OF and stop. It cannot be restarted.

14-00000 1000000
1000000
1000000

1000000 1000000
1000000 1000000